

Formation of the coordination abilities in children with hearing impairments based on exercises with the force platform

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Abstract. *The purpose of the article is to show the effectiveness of the formation of coordination abilities in children with hearing impairments using a force platform. This article discusses the problem of the formation of coordination abilities in physical education classes using exercises developed for a force platform with biofeedback. The theoretical prerequisites for the use of the force platform as a means of forming coordination (balance) of children with hearing impairments are described. As part of this study, a pedagogical experiment was conducted aimed at comparing and identifying the effectiveness of exercises with the force platform. The results of the experiment prove that the combination of general physical education exercises and exercises with the force platform contribute to the most effective formation of coordination in children with hearing impairments. The authors conclude that it is possible to implement these exercises in a physical education program in special correctional schools.*

Keywords - *force platform; exercises with biofeedback; coordination abilities; children with hearing impairments.*

I. INTRODUCTION

Currently, one of the most important socio-pedagogical and biomedical problems is the problem of harmonious physical development and training of children with hearing impairments.

Approximately 8% of the world's population suffer from hearing impairments. About 13 million people with hearing loss or hearing impairment live in the Russian Federation, of which about one million are children [6].

Movement is of great importance for growth and development. For children with hearing impairment, movement is a particularly important developmental factor. Physical exercises allow maintaining the necessary level of working capacity and stimulating the development of the functional systems of the body. Complicated movements are important for children with hearing impairment. Performing physical exercises for coordination abilities contributes to the development of the cortex of the cerebral hemispheres, which is especially important when correcting the performance of the auditory analyzer [7].

Hearing impairment leads to difficulties in the perception of the world. For children with hearing impairment, it is difficult to get an education, to work and communicate with

people around. Disturbances of the auditory analyzer are accompanied by motor disturbances. While the indicator of the physical development in children is one of the main criteria for the health of society. Unfortunately, physical development in children with hearing impairment is slow. Hearing pathology slows down the "natural course of physical development" [6].

If children with hearing impairment are not significantly behind the norm by other physical indicators, then deviations are more significant in the development of coordination abilities. Children with hearing impairments spend more energy on movements and learn them longer [3].

Movement disorders are primarily associated with the vestibular apparatus. Disorders in the vestibular analyzer affect the coordination abilities of children, including the ability of maintaining balance and spatial orientation. In general, the movements of children are constrained and gross [4].

Therefore, it is advisable to conduct physical education classes with an emphasis on the formation of coordination abilities.

II. LITERATURE REVIEW

In the work of V.I. Usachev, it is noted that the performance of the vestibular apparatus and the analysis of information from proprioceptors of the support area play a significant role in maintaining the balance of the body. An auxiliary, but still essential role in maintaining balance is played by visual information [9].

An analysis of the literature shows that exercises on the force platform are used to evaluate the balance function, and they can also be used for training balance [1; 2; 8; 11].

Performing exercises contributes to the improvement of the balance-related organs - the vestibular apparatus, visual and motor analyzer. Biological feedback used in the force platform allows forming motor reactions aimed at maintaining the balance.

In the work [5], it is indicated that functional computer stabilometry based on recording and analysis of fluctuations in the center of pressure of the human body has been increasingly used. "This method makes it possible to

objectively assess the severity of disturbances in the balance function and control the dynamics of the pathological process" [5, p. 85].

The use of exercises with the force platform allows improving physical education classes, expanding the means of physical education and increasing the effectiveness of rehabilitation measures in general [10].

Thus, we found a contradiction between the insufficient physical development and physical fitness of children with hearing impairments.

III. AIM

The purpose of the study is to describe the effect of exercises with the force platform on the formation of coordination abilities in children with hearing impairments.

IV. MATERIALS AND METHODS

The study was conducted in two stages. At the first stage, we developed a methodology for using exercises with the force platform during PE classes for children with hearing impairments. At the second stage, a pedagogical experiment was conducted to determine the effectiveness of exercises with the force platform as a means of forming the coordination abilities in children with hearing impairments. A three-month pedagogical experiment was conducted on the premises of a special school for hearing-impaired children in Chelyabinsk. 28 hearing impaired boys aged 7-9 years participated in the study. The sample was divided into 2 groups, 14 persons each.

The coordination abilities of the subjects were measured before and after the pedagogical experiment. The following tests were used for determining coordination abilities: Romberg test (with eyes open and closed); the bench test; three forward rolls; the flying swallow pose.

Physical education classes using exercises with the force platform were conducted with children of the experimental group. During the PE classes, each student for 10 minutes performed the exercises with the force platform. Classes were held three times a week. Exercises with the force platform were carried out in the form of games using the Stablan-01 system with biological feedback.

V. RESULTS AND DISCUSSION

The results of the pedagogical experiment show that physical education classes with the experimental methodology contribute to more efficient formation of coordination abilities in boys with hearing impairment compared to traditional PE classes. A group of children who performed exercises on a stable platform showed the best results.

In the Romberg test with open eyes before the experiment in the control and experimental group of hearing impaired boys there were no significant differences - 4.4 and 4.5 s. respectively ($p > 0.05$), and after the pedagogical experiment, the results between groups became significantly different - 6.1 and 8.5 s. respectively ($p < 0.05$). Thus, after the experiment, the difference between the control and the experimental group is 39.3%.

In the Romberg test with closed eyes before the experiment in the control and experimental group of hearing impaired boys there were no significant differences - 3.0 and

3.2 s. respectively ($p > 0.05$), and after the pedagogical experiment, the results between groups became significantly different - 4.5 and 5.5 s. respectively ($p < 0.05$). Thus, after the experiment, the difference between the control and the experimental group is 22.2%.

In the bench test before the experiment, in the control and experimental group of hearing impaired boys there were no significant differences - 5.7 and 5.8 s. respectively ($p > 0.05$), and after the pedagogical experiment, the results between groups became significantly different - 5.5 and 4.4 s. respectively ($p < 0.05$). Thus, after the experiment, the difference between the control and the experimental group is 25%.

In the three forward rolls test before the experiment in the control and experimental group of hearing impaired boys there were no significant differences - 10.5 and 11.0 s. respectively ($p > 0.05$), and after the pedagogical experiment, the results between the groups became significantly different - 9.5 and 7.5 s. respectively ($p < 0.05$). Thus, after the experiment, the difference between the control and the experimental group is 26.6%.

In the swallow pose test before the experiment in the control and experimental group of hearing impaired boys there were no significant differences - 3.4 and 3.5 s. respectively ($p > 0.05$), and after the pedagogical experiment, the results between groups became significantly different - 5.5 and 9.5 s. respectively ($p < 0.05$). Thus, after the experiment, the difference between the control and the experimental group is 72.3%.

VI. CONCLUSION

As a result of a pilot study, we can conclude that exercises with the force platform contribute to the effective formation of the coordination abilities in children with hearing impairments. The combination of physical education exercises and exercises with the force platform contributes to the most effective formation of coordination in children with hearing impairments. In our opinion, exercises with the force platform should be included in the physical training program.

Further study of the formation of coordination abilities in children with hearing impairments with the help of the force platform can be devoted to children with complete dysfunction of the auditory analyzer.

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